



Operational Readiness Evaluation (ORE) Plan

FISCHER & PORTER

RECORDING RAIN GAUGE UPGRADE (FPU)

Cooperative Observer (COOP) Program

October 15, 2003

**U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service
Office of Climate, Water, and Weather Services**



Observing Services Division

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Executive Summary

The primary objective of this Plan is to determine if the NWS can use the FPU modified Fischer & Porter (F&P) gauge to collect, represent, and disseminate precipitation data to the same level of quality as the mechanical paper tape recording F&P gauge. Both types of gauges will be operated by NWS Coop Observers who send precipitation data to their local NWS Weather Forecast Office (WFO). In both cases the WFO will check the data and send it to a data repository. The operational readiness evaluation (ORE) involves 15 cooperative weather observer sites (two per Region except four in Southern Region) and their respective WFO. The ORE will be conducted for two months starting November 3, 2003. During the ORE the NWS and National Climatic Data Center (NCDC) will validate as successful, the accurate, reliable, and continuous end-to-end data transfer and data application for the end users. The FPU data is created after precipitation measurements are manually saved to a data key once per month. End users, initially will be the WFOs and NCDC. After the readiness evaluation has concluded and NCDC has added the FPU data to its publications, potentially thousands of interested agencies, organizations, and private users will become end users.

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ACRONYMS

AWIPS	Advanced Weather Interactive Processing System
CES	Coastal Environment Systems
CMIS	Configuration Management Information System
CO	Contracting Officer
COOP	Cooperative Observer Program
COTR	Contracting Officer Technical Representative
CSSA	Cooperative Station Service Accountability
CWA	County Warning Area
DAPM	Data Acquisition Program Manager
DCOM	Data and Communication Unit
EMRS	Engineering Management Reporting System
ESD	Electro-static Discharge
ET	Electronics Technician
EEv	Extreme Environment Enclosure(Type of GMA Shelter)
FPU	Fischer-Porter/Belfort Upgrade
FTP	File Transfer Protocol
FY	Fiscal Year
GMA	Gauge Modification Assembly
HMT	Hydrometeorological Technician
LST	Local Standard Time
MIC	Meteorologist-In-Charge
MIRS	Management Information Reporting System
MTBF	Mean Time Between Failure
NCDC	National Climatic Data Center
NLSC	National Logistics Support Center
NRC	National Reconditioning Center
NSN	National Stock Number
NTDB	National Transition Data Base
NWS	National Weather Service
NWSI	National Weather Service Instruction (e.g., NWSI 10-1307, NWS COOP Weather Observer Program)
OI	Operational Implementation
OIP	Operational Implementation Plan

OPR	Office of Primary Responsibility
ORE	Operational Readiness Evaluation
POC	Point of Contact
PPI	Planned Product Improvement
RAM	Random Access Memory
RCPM	Regional COOP Manager
RDM	Removable Data Media (the red plastic turn key)
REL NOTE	Release Note
RFP	Regional Focal Point
SRG	Standard Rain Gage (non-mechanical, 8" aperture)
ST	System Test
TCPIP	Transmission Control Protocol / Internet Protocol
TTR	Test Trouble Report
WFO	Weather Forecast Office
WSH	Weather Service Headquarters
WSOM	Weather Service Operations Manual

List of Organizational Codes

<u>Code</u>	<u>NWS Organization</u>
CCx2	National Logistics Support Center
OPS11	Engineering & Acquisition Branch
OPS12	Maintenance Branch
OPS13	Configuration Branch
OPS14	Logistics Branch
OPS22	Observing Systems Branch
OPS23	Software Branch
OPS24	Test & Evaluation Branch
OPS31	Operations Support & Performance Monitoring Branch
OS7	Observing Services Division
OST1	Office of Science and Technology, Programs & Plans Division

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The Operational Readiness Evaluation (ORE) Plan for
Fischer-Porter/Belfort Recording Rain Gauge Upgrade (FPU)

1. Introduction:

There are fifteen FPU systems installed throughout the six Regions of the NWS. A table of station associations is located in Section 13. Installation was performed in 2002 in accordance with NWS Engineering and Acquisition Branch (OPS11) instructions and plans given by the ***Product Improvement Implementation Plan for Fischer & Porter Sensor Upgrade***. The ***Operational Readiness Evaluation (ORE) Plan*** relies on the reader's knowledge of NWS-specific instructions contained in the ***FPU Observer Instructions, NWSREP ORE Instructions, and the WFO Data Key Exchange Instructions***. The Coop Observer and the NWSREP shall have the most current versions of the two instruction manuals on station at the start of the ORE. The ORE Plan is for ORE use only, and is not intended for the general use of the Cooperative Observer Program. No instructions in this Plan shall conflict or supersede with NWS policies.

2. Purpose of ORE:

The ORE will judge whether the NWS is ready to accept and certify for use the FPU modification to replace the Fischer-Porter (F&P) gauge's punch tape recording mechanism. The ORE is planned as a scientific evaluation of the FPU so that the NWS can objectively measure the performance of the FPU gauge and the NWS system of data exchange between WFO and NCDC. The ORE will culminate with an ORE Report that summarizes the results of five categories of ORE pass/fail tests.

3. Description of the Fischer-Porter/Belfort Upgrade (FPU):

The FPU is designed to replace the legacy punch tape mechanism of the gauge. As with the paper tape recorder, the upgraded gauge senses, converts, and records precipitation data at 15 minute intervals. The FPU maintains a non-volatile record of the data and is powered by a 12-volt battery with solar recharging. The FPU contains logic sufficient to support monthly data retrieval and allow operator notations to indicate changes such as the emptying of the gauge and other maintenance. An electronic display indicates the amount of captured precipitation in inches of water. The FPU relies on a non-volatile removable 'data key' as the primary means of conveying data from the gauge to the WFO.

4. Components of the FPU:

The Gauge Modification Assembly (GMA) is the principal component. The GMA consists of five major pieces of equipment: the load cell assembly (housed inside the standard F&P rain gauge shroud), ZENO Data Logger, removable Data Key, Solar Panel, and Battery/Recharger. Another primary component is the Data Key Reader.

For cold region deployment, the FPU is configured with a fiberglass Extreme Environment (EEV) Enclosure to enable the battery to be buried underground.

All components of the FPU are described in the Coastal Environment Systems (CES) Technical Manual. The technical manual also discusses the theory of operations, installation and trouble shooting. A five minute overview of the FPU system, courtesy of NWS Southern Region Headquarters is available on: http://www.srh.noaa.gov/mlb/FPU_Project/video.html.

5. ORE Objectives:

The ORE will be the basis by which the FPU systems are tested to determine if the NWS program consistently meets three criteria:

- A. monthly FPU precipitation data shall be available to the NCDC, through the WFO, on the same monthly basis as the paper tape from the F&P, during the two month period of performance.
- B. monthly FPU precipitation data shall be at least as accurate as the F&P system. Just prior to the start, and immediately after the conclusion of the ORE period of performance, a fifteen inch equivalent weight set will test the FPU calibration to verify that it accurately represents a 15.0 inch precipitation measurement.
- C. the electronic format of the precipitation data shall be compatible with NWS information technology (IT) standards to permit simple decoding, file compression, and electronic distribution from point of NWS data reception to end user.

The Office of Operational Systems, Observing Systems Branch (OPS22) is the lead office responsible

for the operational implementation of FPU systems. The OPS22 ensures that the ORE is also an evaluation of the level of NWS management readiness, in that fielded electronic observing systems require multiple levels of managerial support. Before an ORE is conducted, program management must ensure:

- D. Distribution of Operation, Maintenance, and User Guide documents
- E. Implementation of logistics and repair policies
- F. Documentation of performance criteria, test results, and test analyses
- G. Compatibility of data and metadata file formats with comparable legacy systems

In addition, the National Climatic Data Center (NCDC) recognizes its organizational objectives. The primary objective for NCDC is to evaluate the NCDC methods of archiving FPU data and converting data for customer use. NCDC routinely ingests, quality controls, flags, publishes, and archives precipitation data. A secondary objective is to evaluate and determine the success and on-time performance of the WFOs in electronically submitting FPU data to NCDC.

6. ORE Procedures:

6.1 Preparation:

Each ORE site will have been operational with FPU equipment at least 3 months prior to the period of observation. The WFO and the Coop Observer will have printed copies of all NWS issued engineering notes, operations and maintenance manuals, and site visitation guidance on station, at least two weeks prior to the start of the ORE. In the week prior to start of ORE period of observation the NWSREP will drain the FPU collection bucket, make a calibration check, and perform seasonal maintenance. Spare parts for the ORE will be stocked at the NWS Headquarters.

6.2 Period of Observation:

Coop Observers at 15 stations will monitor the FPU daily and transfer FPU data to the WFO on a monthly basis for two months. The Coop Observers will also take a daily observation from the

Standard Rain Gauge (SRG). To illuminate these special Coop Observer operations, the ORE will require three accounting forms be completed by the Observer each month: ***WS Form B-91, Data Event Log***, and the ***FPU Trouble Report***.

The Coop Observer will read both the FPU display and F&P dial indicator on a regular 24-hour basis, at the customary hour of observation, to ensure both gauges are properly collecting, converting, and displaying precipitation measurements. The Coop Observer will follow the instructions contained in the ***FPU Observer Instructions*** guide and make a reading of the FPU value that displays as the RAIN parameter and enter it on the WS Form B-91. The Observer will then make an F&P dial reading of the value shown by the metallic pointer and enter it to the respective column on the WS Form B-91. For an example see Appendix B, ***ORE Plan***.

6.3 Data Collection and Transfer:

The Coop Observer will follow instructions in the ***FPU Observer Instructions*** manual to properly check buckets so they remain unobstructed and within limits for collected precipitation. The Observer will properly operate FPU data logger and submit data to the WFO. Finally, at the beginning of each month the Observer will use the standard NWS-provided mailing envelope to mail the WFO: Data Key, F&P punch tape, WS-Form B-91, and Event Log Worksheet.

The NWSREP will follow the ***NWSREP ORE Instructions*** manual and the ***ORE Plan*** instructions to successfully take delivery of electronic FPU data, save files to a WFO network workstation, and file compress the CSV file that had been created when the WFO read the Data Key.

The NWSREP will transmit the zipped precipitation file (e.g., hpdkrlx1103.zip) to the NCDC by means of File Transfer Protocol (FTP) by the 11th of the month. For procedures, see the ***WFO Instructions - FPU Data Exchange***.

The ORE introduces one principal change in data transfer because the F&P punch tape will be mailed to the NCDC office in Asheville, and not to the NCDC contractor.

6.4 FPU Data Validation:

ORE data validation procedures begin with the NWSREP scrolling through the ASCII text file (comma

separated value) to verify that the evaluation month starts and ends with the proper date and time values. Missing entries can be detected by comparing adjacent lines for the proper hour, minute, and second. The NWSREP shall not analyze the evaluation month's data for all missing entries. Instead, the NCDC will electronically search and calculate the total number of records missed in the given month. The NWSREP can note a missing entry, if detected, to the same ***Event Log Worksheet*** as was mailed by the Observer. If there are serious discrepancies, inconsistencies, or errors, the NWSREP will phone David Desrosiers (OPS11) at NWS headquarters.

Each NWSREP has the once per month responsibility to log the 3 precipitation gauge totals; FPU month total precipitation, F&P punch tape month total, and WS Form B-91 month total, to the ***Gauge Data Evaluation Form*** (Appendix B, ***ORE Plan***). The ORE ***Gauge Data Evaluation Form*** shall be mailed by the NWSREP to the RCPM by the 21st of each month. For specific instructions see, ***NWSREP ORE Instructions***.

The NWSREP is not asked to analyze for the accuracy of FPU precipitation measurements. The NWS Observing Services Division will review ORE evaluation results and if the FPU systems pass test criteria, the ORE Report will recommend the operational use of the FPU systems.

6.5 Program Evaluation:

Four to eight weeks after the conclusion of the ORE period of observation the OS7 will analyze the performance of each of the elements listed in the Section 9, Evaluation Criteria, ***ORE Plan***, and analyze all documentation submitted by the Regions that includes the ***FPU Test Certification Checklist*** items (Appendix C, ***ORE Plan***).

The OS7 will enter ORE test results to a table of associations so performance scores can be calculated for each of three management groups: NWS field operations, NCDC data processing, and NWS program management. The table, known as the evaluation score matrix, will also track how the fifteen FPU sites were managed by their respective WFO. Scores will be the product of a standard set of rules and weighting coefficients applied to each of the ORE evaluation elements and sub-elements.

Approximately ten weeks after the start of the period of performance the Chief, Observing Services Division, will review the ***ORE Certifications*** signed by the Regional SOD Chiefs, and review the composite ORE performance scores calculated by OS7.

6.6 Regional Certification:

Each Chief, Systems Observing Divisions (SOD), and the NCDC, Chief, Data Processing Branch, will receive an ***ORE Certification*** form and ORE documentation (***Certification Checklist***, Appendix C, ***ORE Plan***) from their RCPM approximately 6 weeks after the period of observation concludes. The ***ORE Certification*** is to vouch that the ORE was successfully conducted, all ORE required documentation was submitted to Regional Headquarters, and no substantive issue was left outstanding.

Two weeks from the RCPM's recommendation to review and approve all ORE sites' documentation, the SOD Chiefs and Data Processing Chief are instructed to either approve or disapprove the ORE Certification based upon their Region's (or NCDC's) collective performance. Regional (and NCDC) approval will be communicated by the SOD (and Data Processing) Chief's signing and mailing the ***ORE Certification*** to the Chief, Observing Services Division.

6.7 NWS Recommendation:

The Chief, Observing Services Division, will announce the NWS recommended post-ORE actions and may announce a decision to deploy additional FPU systems. The recommendation will follow the release of the ***ORE Report***, and closure of any outstanding issues. The ***ORE Report*** is the NWS Headquarters' summary of the ORE performance results, lessons learned, and proposed improvements for the management and the integrated operation of the FPU systems.

7. ORE Responsibilities:

Participants in the ORE will collect precipitation data on a coordinated schedule to start 12 AM LST Monday, November 3, 2003, and end 12 AM LST January 3, 2004. This schedule is the period of performance and it is comprised of two evaluation months: November and December. During that period of performance FPU systems will be evaluated by Coop Observer, NWSREP, and the NCDC. Ultimately, it is the responsibility of the NWSREP to ensure that all categories of ORE Certification Checklist items (Appendix C, ***ORE Plan***) are generated, and submitted to the MIC for signature, prior to being submitted to the RCPM, no later than 4 weeks past the end of ORE period of performance.

7.1 Coop Observer Responsibilities:

During the ORE each Coop Observer shall follow once per day and once per month instructions as specified in the, *FPU Observer Instructions*.

- A. Daily, at the Coop Station's conventional hour of observation, the Observer reads the Standard Rain Gage (SRG) collected precipitation (liquid equivalent) and write it to WS Form B-91. The SRG is emptied daily. On last day of month Observer examines the B-91 and adds all SRG precipitation amounts and write the sum to the designated box in the lower-left of the B-91.
- B. Daily, at the Coop Station's conventional hour of observation, the Observer reads the GMA display to ensure it gives valid **Rain** and 24RainDiff values. Observer writes the current **Rain** reading to the column marked '**Rain:**' on the WS Form B-91.
- C. Daily, at the Coop Station's conventional hour of observation, the Observer reads the F&P dial indicator's value and write the current F&P reading to the column marked '**Dial-Pointer**' on the WS Form B-91.
- D. If the Observer recognizes an FPU **Rain:** reading that is discrepant (i.e., $\pm 50\%$) with the F&P dial reading, he will log the occurrence to the *Event Log Worksheet* (Appendix A).
- E. Observer verifies that the *Event Log Worksheet* tells the date and time when the buckets were emptied, calibrated, re-charged with oil and antifreeze, when any interruption in data logging occurs (from maintenance, or unexpected interruption), and the time of download to Data Key.
- F. To complete the WS Form B-91, the Observer takes the daily observation for the last day of the calendar month and writes the observation to the B-91 line that is marked for that same last day of the calendar month.
- G. On the 1st day of new month at the station's conventional observing hour, the Observer takes the daily observations, and enters these values to the new month's WS Form B-91. (The completed month's WS Form B-91 is ready to mail to the WFO.)
- H. On the 1st day of each month, during non-precipitation hours, Observer retrieves the punch tape from the Coop station's F&P (legacy) gauge.

- I. On the 1st day of each month, Observer downloads the GMA data to the Data Key.
- J. As near to the 1st day of month as possible, Observer gathers his data-filled Data Key, the extracted F&P punch tape, the completed month's WS Form B-91, and the Event Log Worksheet, and FPU Trouble Report and packs them into a single envelope addressed to his/her WFO.
- J. Observer mails the envelope to his/her local WFO as near to the 1st of the month as practical.
- K. Observer phones his/her NWSREP if he/she encounters any troubles during the above ORE tasks, or if GMA displays a **Rain** parameter of 10 inches or more.

7.2 WFO Responsibilities:

- A. The NWSREP is responsible for directly communicating to Coop Observer any changes to ORE schedule, operation procedures, data delivery, maintenance, or event logging. The WFO is also responsible for rain gauge maintenance, trouble shooting, repair, and ordering of FPU spares.
- B. NWSREP shall examine the FPU and F&P precipitation sensor within the week prior to the start of the ORE. Place the official calibration weight set into the empty bucket to determine if FPU sensor reads a difference of 15.0 inch (± 0.1 inch) between the empty reading and the weighted reading. At the FPU keypad, enter Annotation Code 220 if no changes were needed, and code 221 if new values had to be entered.
- C. NWSREP shall charge the F&P gauge and the FPU modified gauge, each, with one quart of oil and two quarts of premixed antifreeze. Document the bucket's charged weight that displays on the data logger (FPU) and on the dial wheel (F&P). Write these bucket starting values to the *Event Log Worksheet*.
- C. WFO shall inform OPS11, NCDC, and OS7, via e-mail, of any problems encountered with data or with FTP transmission of data to NCDC.
- D. NWSREP, shall submit a change request to update WS Form B-44, for the 'Other Equipment' category, prior to the start of the ORE, to show non-commissioned FPU equipment. This

action will update the CSSA database.

- E. NWSREP shall **photocopy the Observer's completed WS Form B-91.** NWSREP shall log the date of arrival of each Coop Observer's mailing envelope. Information that is missing (e.g., Data Key, WS Form B-91, F&P punch tape, or *Event Log Worksheet*) will require a phone call to Observer. Phone Observer on 7th day of month if Observer's envelope has not arrived at WFO.

- F. By the 7th day of month NWSREP shall read the Data Key into workstation or Laptop PC. Inspect the comma separated value (CSV) file's final lines for date/time information to verify proper month's precipitation data was delivered. Scroll directly to the beginning of the same month's records and inspect the date/time value of the first day of month. In this way WFO confirms the most recent month's first five lines and last five lines are populated with legitimate data. If the beginning and ending lines (fifteen minute records) contain missing data, or skipped readings, then the NWSREP shall log the discrepancy to the *ORE Event Log Worksheet* (Appendix A).

- G. By the 7th day of month NWSREP shall examine the Observer's B-91 gauge entries for FPU and F&P readings. Locate the **Rain** and the **Dial-Pointer** columns on the top-right side of the B-91. Start with FPU daily readings and subtract Day 1 from Day 2 reading and write this difference to the blank box directly to the right of the Day 2 FPU reading. Then subtract the Day 3 reading from the Day 2, and enter this difference to the blank box directly to right of the FPU reading for Day 3. Continue until the last record of the month is completed. In the same way calculate the daily differences for the F&P entries. Sum the values for each gauge, and write into the lower-right portion of the B-91. See the example B-91 in the Appendix B, ***ORE Report***. Enter the month total values to their respective boxes in the ***Gauge Data Form*** (Appendix B).

- H. By the 7th day of the month, NWSREP mails the original (not photocopy) WS Form B-91:
 NCDC Services Center
 Image Entry
 465 Industrial Boulevard

London, KY 40741

- I. By the 7th day of month, NWSREP mails the monthly F&P punch tape to NCDC:
 NCDC, Attn: Mr. Stuart Hinson
 Federal Building, Room 420
 151 Patton Avenue
 Asheville, NC 28801

- J. By the 11th day of month the NWSREP shall FTP transmit FPU precipitation data to NCDC
 (see the, *WFO Instructions for Data Key Exchange*) Host Name / Address:
<ftp.ncdc.noaa.gov> with User ID: anonymous, and Password: your.name@e-mail.address.

- K. By the 11th day of month NWSREP mails back a Data Key to the Coop Observer.

- L. By 15th day of month, NWSREP accesses the ORE site's monthly data report on the FPU
 Station Data Status web page, <http://www.ncdc.noaa.gov/nwsonly/hpdingest/oresites> . FPU
 monthly total will be available within three hours of your FTP transmission to NCDC.
 1. Enter the FPU month total precipitation amount to the FPU column of the Gauge
 Data Form (Appendix B).
 2. Confirm NCDC web page, <http://noaa.imcwv.com/login.asp>, displays the most
 recently completed month's WS Form B-91, with the same SRG precipitation
 amounts in hundredths of an inch as you have summed to the SRG column in the
Gauge Data Form.
 3. Enter the F&P punch tape monthly total (as decoded by NCDC) to the F&P
 column in the *Gauge Data Form*.

- M. By the 21st day of month, the NWSREP mails the RCPM a copy of:
 1. Print-out NCDC's web page to show on-time receipt of monthly FPU data
 2. Print-out of NCDC web page to the monthly availability percentage
 3. ***Gauge Data Form*** (monthly precipitation totals), and
 4. ***ORE Event Log Worksheet***.
 5. ***FPU Trouble Report***.
 6. Print-out of entire month's FPU text file (with 15-minute reports)

7. Precipitation sensor calibration check signed by the NWSREP's on the ***Event Log Worksheet*** with annotation of either 220 (no changes necessary) or 221 (new values entered).

N. The following FPU items shall be kept at the WFO by the NWSREP:

1. Electronic copy of the month's FPU files (CSV) shall be stored for at least 12 months on a network workstation.
2. Paper copy of the monthly ***ORE Event Log Worksheets*** shall be kept for at least 12 months.
3. Paper or electronic copy of any ***FPU Trouble Report*** Forms for 12 months.
4. Paper or electronic copy of the monthly, ***Gauge Data Form*** (Comparison) for 12 months.
5. One spare Data Key shall be kept on station, always.

7.3 Reporting FPU Status:

The Observer shall notify the NWSREP if the GMA display fails to respond or behaves in an unusual way. The NWSREP shall then file an ***FPU Trouble Report*** (Appendix F), and fax the report to the RCPM as soon as practical from the time the outage or anomaly was discovered.

The NWSREP shall journal each of his GMA actions into the Observer's copy of the Event Log Worksheet (Appendix A) and journal the Operator Annotation codes entered to GMA.

At the end of the month the Observer shall review his station's ***ORE Event Log Worksheet***. If the FPU system behaved without incident (e.g., no break downs or interruptions) the Observer shall write 'No Unexpected Outages' on the bottom line of the ***FPU Trouble Report***.

The Observer mails the Event Log Worksheet to the WFO together with the FPU Data Key, F&P tape, and WS Form B-91.

7.4 Filing an FPU Trouble Report:

If FPU becomes inoperable or degraded for any reason (i.e., insufficient battery voltage), the Coop Observer shall note the date, time, and nature of the problem to the ***Event Log Worksheet*** (Appendix

A) and phone the NWSREP to report the problem. The NWSREP shall then file an ***FTU Trouble Report*** and fax it to the RCPM. The RCPM shall inform David Desrosiers (OPS11) as soon as practical.

7.5 RCPM Responsibilities:

The RCPM shall communicate NWS policy and procedures on the ORE to the responsible WFO. The RCPM is responsible for ensuring the WFO have received all equipment and documentation necessary to follow the ORE instructions. At the conclusion of the two month period of performance the RCPM shall compile all ***FPU Test Certification Checklist*** items from the WFO and summarize issues that were communicated by phone or e-mail.

Each month the first 7 items of the ***FPU Test Certification Checklist*** (Appendix C) have to be received and reviewed by the RCPM. It is the responsibility of the NWSREP (***ORE Plan***, Section 6.2, Paragraph L) to submit these reports each month to Region.

After the period of performance concludes, and after all WFO supporting documentation has been received (Appendix C), the RCPM shall request the approval of the ***ORE Certification*** (Section 15, ***ORE Plan***) of the Chief, Systems Operations Division (SOD) at Regional Headquarters. After SOD Chief's approval and signature, the RCPM will FedEx the single page, ***ORE Certification***, with the supporting documentation to Andy Horvitz, at NWS Headquarters.

7.6 NCDC Responsibilities:

The NCDC shall run a web-based ORE Station Data Status board to display the three types of precipitation reports that are successfully submitted to NCDC each month. For each of the fifteen ORE sites, the display will show the FPU monthly precipitation, the F&P decoded monthly precipitation, the SRG monthly precipitation, and the station's WS Form B-91 as an optically scanned graphic. All precipitation data files shall posted by the 15th of month, with a quick check capability for the FPU data within 3 hours of FTP transmission.

The NCDC shall time and date stamp each ORE site's FPU data when it arrives to NCDC. The date stamp shall be posted to the ORE Station Data Status web page. Data files that fail to be received by the end of the 15th day of the month the NCDC will flag the ORE Site as 'late' for that month. Sites

that fail to successfully FTP transmit their first or second month's FPU data by the 21st day past the last day of the ORE, will be flagged by NCDC as missing.

Prior to the start of the ORE, the NCDC shall develop a data-reading algorithm that will scan each ORE site's FPU data to count the number of 15-minute records missing in a month. The algorithm will also count the number of missed 15-minute records due to unexpected system outages apart from outages annotated manually by an operator who purposely interrupted the system. The NCDC shall post these availability data to its ORE Station Data Status web page.

The NCDC will maintain two types of FPU precipitation records for seven years. The first type shall be the raw data files. The second shall be the quality controlled files that are generated to flag suspect data for NCDC publication purposes. In this way NCDC will archive all FPU data and extend its ability to quality assure Hourly Digital Precipitation (HDP) data.

7.7 National Headquarters Responsibilities:

The Observing Services Division (OS7) shall ensure that NWS region and field offices have adequate maintenance and logistics support to keep FPU systems operational with minimum outage times (e.g., ninety-six hours). Procedures for preventive and corrective maintenance are found in the, *FPU Technical Manual*, Section 5. Requests for spares or repair parts should be directed to David Desrosiers (OPS11) on 301-713-1845 x115, or e-mail david.desrosiers@noaa.gov

The OS7 will request NCDC deliver summary reports every 6 months to outline the status of FPU archive operations and to report on precipitation data quality control procedures (e.g., PrecipVal) that were developed to use FPU data.

8. Event Log Procedures:

All ORE participants are advised to create a worksheet similar to the one on Appendix A, to record important or significant events during the period of observation. The worksheet allows for entries of significant events and dates as well as any corrective actions taken including those that require WSH or RCPM acknowledgments. Worksheets should be retained on file at your station for at least twelve months.

If any of the components indicate problems or malfunctions which hinder data collection or prevents data collected from reaching its intended users, the COOP Observer is instructed to inform by telephone the appropriate person listed in Section 14 of this ORE Plan.

9. Evaluation Criteria:

9.1 Performance Measures and Metrics:

This Plan specifies five areas to be quantitatively evaluated: FPU gauge accuracy, FPU data reliability, FPU data convertibility and transfer, FPU equipment replacement, and FPU data archive adaptability at NCDC.

Gage Accuracy: ORE gauge performance will be measured with a sensor calibration check that employs the fifteen inch equivalent weights, in the week prior to start of 2 month period of observation.

Data Reliability: The number of missing fifteen minute records per month will serve as the metric to measure FPU data availability and FPU systems reliability.

FPU Data Convertibility and Transfer: Success of FPU data transfer from GMA, to Data Key, to WFO network, to NCDC, will be measured by the total number of missing and late monthly FPU files as determined by NCDC.

Key Reader performance will be measured by the total number of failed events in the 15 site network when any operational data key and key reader device fails to store data from the GMA or fails to read data to the WFO workstation.

FPU Equipment Replacement: The distribution of logistics documents that identifies all line replaceable units (LRU) by Agency Stock Numbers (ASN) and National Stock Numbers (NSN) is the first part of the evaluation. Maintenance logistics capability will be based on two FPU spare kits available at national headquarters for ORE use. The total number of hours from the report of FPU system outage to equipment arrival at Coop Site will quantify logistics capability.

NCDC Archive Adaptability: The NCDC will receive raw data from the WFO. It will maintain an archive of FPU raw data for seven years. During the ORE the NCDC will perform basic quality control

and flag the suspect data values and then save the publish-ready set in a file format capable of being further quality controlled.

9.2 Data Comparison Procedures:

The NCDC will ensure the accurate de-coding and calculation of month total precipitation amounts from the three sources: FPU, F&P legacy, and the SRG type rain gauges.

Each ORE site's monthly precipitation values will be posted by NCDC to the ORE station data status web page, on: <http://www.ncdc.noaa.gov/nwsonly/hpdingest/oresites>.

For ORE purposes the FPU month total precipitation data will be calculated as the difference between the Observer reported 'current level' observations as entered by the Observer to the WS Form B-91 on November 3, 2003; December 3, 2003; and January 3, 2004. In the same manner F&P month total precipitation data will be calculated. The SRG gauge data is summed by the Coop Observer and reported directly on the WS Form B-91.

The ORE month total precipitation comparisons will never involve either the FPU displayed 24RainDiff, or the FPU internally derived twenty-four hour value produced just prior to midnight local standard time.

9.3 Pass/Fail Standards:

The FPU operational evaluation will use the following criteria to establish pass/fail standards.

- A. After initial calibration with the standard calibration weigh set, one week prior to ORE start, the FPU and F&P precipitation sensors must register 15.0 inch plus or minus 0.1 inch.
- B. At least 84% of each site's FPU fifteen minute records shall contain valid data from the given month. The NCDC will examine all data and report the availability once per month.
- C. All sites' monthly data files must be received by NCDC by 15th of month. The passing grade will permit only 1 lateness among all fifteen sites.
- D. Two FPU spares kits shall be maintained at NWS headquarters with parts identifiable by ASN

and NSN.

- E. NCDC will submit documentation to OS7, no later than fifteenth week after ORE start, to describe the way it quality controls FPU data for publication. Documentation shall name workstation hardware, operating system, software languages, and archive media (CD, tape, etc.) and print sample meta-data files generated when FPU was archived during the ORE.

9.4 ORE Certifications:

The RCPM shall use the *FPU Test Results Check List* (Appendix C) to ensure the WFO submits all the necessary ORE checklist documentation in the form of a single WFO Packet, to the region headquarters. The WFO shall submit one packet of documentation per month, using the Appendix C, *ORE Plan*, as the cover sheet. The Meteorologist in Charge (MIC) shall sign the cover page as witness.

WFO compliance with the ten item checklist requirements will therefore prove the ORE evaluation category tasks outlined in Section 9, *ORE Plan*, were sufficiently measured. The data include information collected before, during, and after the ORE period of performance. The RCPM must note (e.g. checklist item #7) any instance when spare parts or corrective software had to be installed to the FPU systems. The RCPM shall verify each packet of ORE test results faxed or mailed to the Regional Headquarters, was properly coordinated and includes the MIC signature.

After the RCPM reviews the two monthly, MIC signed, 'FPU Test Results Checklist' reports from each WFO, and no later than fifteen weeks from the start of the ORE, the RCPM shall brief the Region's SOD Chief with all the submitted WFO documentation and regardless of pass / fail performance status, certify that the ORE tests have been conducted and evaluations from each respective WFO are now complete. The RCPM will then advise the Region's SOD Chief to sign and date the ORE Certifications page (Section 15, *ORE Plan*).

When all six NWS Regions have submitted their signed FPU ORE Test Certification to NWS headquarters, the Chief of the Observing Services Division (OS7) will review, approve, sign and date the ORE Test Certification. If major problems were reported or irreconcilable discrepancies were noted by the Regions, the Observing Services Division will announce the next proper action.

10. The ORE Report:

The ORE Report will be the basis by which NWS certifies FPU equipment for operational use in the Cooperative Observer Program. The NWS Observing Services Division will prepare the report to summarize FPU operational performance as based on specific performance measures and their pass/fail standards. The report will comment on FPU gauge performance and the value it brings to climate operations programs. The NCDC, Hydrology and Upper Air Division will provide a report on the timeliness, quality, and continuity of FPU gauge data. The Observing Services Division will report any WFO, Coop station, NCDC operational integration issues and provide recommendations to trouble shoot or correct any deficiencies. The ***ORE Report*** will be completed and distributed to the points of contact listed in this Plan, about ten weeks after the close of the ORE period of performance. Other special evaluations and recommendations may be reported separately after the ORE Report is released.

11. Program Management Impacts:

11.1 Documentation:

Appendix E of this document gives a comprehensive list of the NWS engineering notes, operator instructions, and policy handbooks that pertain to the FPU system.

Prior to ORE completion, NWSREP will ensure that Coop Station and WFO configuration (e.g., Data Key Reader) changes are properly documented. This requires four administrative actions. They are:

- A. Data Entry into EMRS,
- B. Data entry into CMIS,
- C. Data entry into MIRS,
- D. Data entry into the CSSA.

The NWSREP shall perform the EMRS update. The DAPM (or HMT) shall perform the CSSA update. Then the CMIS shall be updated from the new information in the EMRS. The OPS12 will ensure the EMRS update is accomplished and OPS13 will ensure the CMIS update is completed. The MIRS will be updated through the EMRS input to the CMIS. The OPS22 will ensure that the MIRS

staff makes timely updates to the MIRS. The OS7 will ensure the CSSA update is completed.

After ORE completion and after FPU maintenance notes are approved for the care of FPU flexure parts, the OPS12 will issue an engineering Mod Note to revise the Engineering Instruction Note, Number 4.

11.2 Training:

The OS7 shall provide the NWSTC a copy of the ORE Report and a copy of ORE test results to enable the NWSTC to determine how best to address the operational training needs of both the WFO and the Coop Observers who may be operating and maintaining the approximately 250 FPU systems that could be deployed.

The NWSTC will be asked by OS7 prior to ORE completion to advise management on whether remote training module handbooks (with student exam), video remote training, or NWSTC in-class training needs to be developed as part of an overall Coop Observer Program training effort.

The NWS Office of Operational Systems, Engineering Design Branch (OPS11), should advise OS7 prior to issuance of the ORE Test Report, any specific FPU maintenance weaknesses might seriously degrade performance or produce FPU system outages. Those maintenance needs will then be communicated to the NWSTC and the Logistics Branch (OPS14).

11.3 Data Integration:

When the Data Key is read by the key reader, a data file is automatically created and named in the following format: coopidno_yyyymmdd_hhmmss_yyyymmdd_hhmmss.csv . The first eight letters refer to the Coop Site Number (e.g., 0001 for Alabama and 0008 for Aberdeen, AL), the next two blocks indicate when the data collection began on the year, month, day, hour, minute and second, and the final two blocks indicate when data collection ended on the year, month, day, hour, minute, and second. Although files are created only once each month, the file contains almost all of the three most recent months' of precipitation data. Nonetheless, each full file occupies about 50 kB, a relatively small size.

The WFO shall ensure the FPU raw data files (CSV) are stored on the DAPM or HMT workstation to accommodate requests to reproduce, study, or apply files to generate derived products.

11.4 Data Continuity Program:

NWS may decide to conduct continuity studies on selected sites or all of the sites consistent with staffing, workload, and urgency to ensure quality assurance of recording rain gauge data. If the FPU system can perform as designed, to deliver reliable, accurate, timely, and consistent data from initial stage to the end users, the continuity study may reveal possible biases and their causal mechanisms that might work upon some or all of the 2,600 F&P punch block recorders.

The Observing Services Division (OS7), in coordination with the Climate Services Division (OS4), RCPMs and WFOs - as well as Regional Climate Centers and State Climatologists - will decide which of these sites will be designated to perform data continuity inter-comparison.

FPU rain data may serve as a means for the WFO to quality assure other rain gauge measurements made by Cooperative Weather Observers with other types of equipment.

12. FPU Trouble Report:

The NWSREP, Coop Observer, and NCDC shall file an FPU Trouble Report (Appendix F) whenever a specific portion of the FPU system becomes degraded or fails during the ORE. The systems include: rain gauge equipment, GMA data logging, key data download, upload, data QC, FTP transmission, or NCDC file handling. The NWSREP should submit trouble reports via fax to their RCPM and NCDC should submit trouble reports via e-mail to Andy Horvitz, at OS7.

13. FPU ORE Sites and Climate Continuity:

FPU Operational Readiness Evaluation (ORE) Site Names and Associated WFO Site Identifiers.

COOP SID CSSA Abbrv.	COOP Site Official Name	State	WFO Site	COOP Number	Climate Division	Elevation MSL
1. MLBF1	Melbourne	FL	MLB	08-5612	04	35 ft
2. WTCM7	NWSTC	MO	NWSTC	23-4377	01	1,030 ft
3. SWLM8	Swan Lake	MT	MSO	24-8087	01	3,100 ft
4. GRFN8	Grand Forks Univ	ND	FGF	32-3621	03	830 ft
5. FACO3	Falls City	OR	PQR	35-2800	01	690 ft
6. NSHT1	Old Hickory	TN	OHX	40-6806	03	590 ft
7. FWDT2	Fort Worth	TX	FWD	41-3285	03	644 ft
8. KCIV2	Sterling (RCS)	VA	LWX	44-8084	04	270 ft
9. WKFV2	Wakefield WFO	VA	AKQ	44-8800	01	200 ft
10. RLX	WFO Charleston	WV	RLX	46-8351	03	576 ft
11. CTEA2	Central No.2	AK	AFG	50-1466	08	920 ft
12. KLKA2	Kenny Lake 7SE	AK	AFC	50-4567	04	1,240 ft
13. KAXH1	Kaumana	HI	HTO	51-3510	06	1,180 ft
14. WMLH1	Waimanalo Nanokio	HI	HFO	51-9534	02	120 ft
15. JSU	San Juan WSFO AP	PR	SJU	66-8812	01	10 ft

14. List of ORE Focal Points for NWS Regional Coordination:

Eastern Region:	Sergio Marsh, RCPM.	631-244-0169
Backup POC:	N/A	FAX: 631-244-0168
Central Region:	Bob Bonack, RCPM	816-891-7734 x730
Backup POC:	N/A	FAX: 816-891-7810
Southern Region:	Mike Asmus, RCPM	817-978-7777 x133
Backup POC:	N/A	FAX: 817-978-2020
Western Region:	Susan A. Nelson, RCPM	801-524-5138 x274
Co-Manager:	Harold Knocke, RCPM	801-524-5121 x276
Backup POC:	N/A	FAX: 801-524-3181
Pacific Region:	Derek Leeloy, RCPM	808-532-6433
Backup POC:	Orlando Almarza, HI	808-933-6938
Fax Number:	PRHQ	FAX: 808-532-5569
Alaska Region:	Jim Hunter, RCPM	907-271-5124
Backup POC:	N/A	FAX: 907-271-3711
OS7 Division:	Andy Horvitz, NCPM	301-713-1792 x150
Backup POC:	N/A	FAX: 301-713-2099
NWS Engineering:	David Desrosiers	301-713-1845 x115
Backup POC:	N/A	FAX: 301-608-0978
NCDC Hydro/UA:	Stuart Hinson	828-271-4437
Backup POC:	N/A	FAX: 828-271-4022

WFO Telephone Contacts:

If NWSREP has designated a backup NWSREP then also provide his/her phone number to RCPM.

#	<u>WFO Name (ID)</u>	<u>NWSREP Name / Alternate</u>	<u>Phone Number</u>
1.	Melbourne, FL (MLB)	Dave Jacobs	321-255-0212 x225
2.	NWSTC, MO (NWSTC)	Mike Wyatt	816-880-9594
3.	Missoula, MT (MSO)	Stan Krenz.	406-329-4713
4.	Eastern N. Dakota (FGF)	Mark Ewens	701-772-0693
5.	Portland, OR (PQR)	Clint Jenson	503-326-2340 x225
6.	Nashville, TN (OHX)	Ralph Troutman	615-754-4634 x225
7.	Ft. Worth, TX (FWD)	James Maxwell	817-831-1668
8.	Balt-Washington, VA (LWX)	John Newkirk,	703-260-0107 x225
9.	Wakefield, VA (AKQ)	Richard Curry	757-899-4200
10.	Charleston, WV (RLX).	James Campbell	304-746-0180
11.	Fairbanks, AK (AFG)	Ron Stuvek	907-458-3708
12.	Anchorage, AK (AFC)	Dan Keirns	907-266-5121
13.	Hilo, HI (HTO) [KAXH1].	Orlando Almarza (Hilo)	808-933-6938
14.	Honolulu, HI (HFO) [WMLH1]	Neil Honda (Oahu)	808-973-5286 x237
15.	San Juan, PR (SJU)	Pancho Balleste-Baeza	787-253-4586 x225

- a. WFO for this COOP Site: _____
(WFO Name & Phone number)
- b. NWSREP for this COOP Site: _____
(Name & Phone number)
- c. COOP Station with FPU: _____
(Station Name & Number as in CSSA)
- d. RCPM for this Coop Site: _____
(Name & Phone number)
- e. FPU Engineer: David Desrosiers (OPS11) 301-713-1845 ext 115
(For technical or equipment problems only)
- f. National Climatic Data Center: Stuart Hinson 828-271-4437
(FPU Focal Point)

15. ORE Certifications:**Signatures and Dates to Certify Successful Submission of all WFO Packets**

Eastern Region : _____ Date: _____

Theodore Wilk, Chief, Systems Operations Division

Southern Region : _____ Date: _____

Thomas Grayson, Chief, Systems Operations Division

Central Region : _____ Date: _____

Thomas Schwein, Chief, Systems Operations Division

Western Region : _____ Date: _____

Robert Tibi, Chief, Hydrological Service Division

Alaskan Region : _____ Date: _____

Herschel Knowles, Chief, Systems Operations Division

Pacific Region : _____ Date: _____

Edward Young, Chief, Technical Services Division

NCDC Focal Point: _____ Date: _____

Steve Del Greco, Chief, Data Processing Branch

OS7 Focal Point : _____ Date: _____

Andy Horvitz, Leader, NWS Cooperative Observer Program

<To Be Signed by > Rainer Dombrowsky

<Title> Chief, Observing Services Division, W/OS7

<Date> _____

APPENDIX A: ORE EVENT LOG WORKSHEET

WFO: _____

COOP Site Number : _____

NWS Region: _____

DATE: MM / DD / YY	End weight (inches) of the precip weighted bucket (includes oil, antifreeze charge).	Calibration Check: Was a correction adjustment needed? If so, how much?	Begin weight (inches) of the charged bucket with 1 qt oil plus 2 qts premixed anti-freeze.	Replaced a major FPU component? Yes or No.	Hour and Minute of Monthly Download to Data Key ?	Remarks on FPU ORE
____/____/____ Days before ORE	<u>FPU F&P</u> ____ ____	<u>FPU F&P</u> ____ ____	<u>FPU F&P</u> ____ ____			
____/____/____ Day after ORE	<u>FPU F&P</u> ____ ____	<u>FPU F&P</u> ____ ____	<u>FPU F&P</u> ____ ____			

The COOP Observer should note all important events throughout the ORE study. Always write the date and time when FPU precipitation data is downloaded to the Data Key. An Observer or an NWSREP may design his/her own local worksheet to suit his/her needs so long as the contents of the worksheet contain the same categories as above. Mail this form together with the Data Key, F&P tape, and WS B-91, to your WFO.

NWSREP (Name, Printed)

Pre-ORE Site Visitation (Sign and Date)

Post-ORE Site Visitation (Sign and Date)

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APPENDIX B :
GAUGE DATA EVALUATION FORM
TO BE SUBMITTED BY WFO TO RCPM EACH MONTH

COOP STATION: _____ **WFO:** _____ **REGION:** _____

EVALUATION MONTH	FPU REPORTED IN B-91	SRG REPORTED IN B-91	F&P Punch Tape REPORTED IN B-91
November 2003	Example 3.26 inches	Example 3.23 inches	Example 3.3 inches
December 2003			
January 2004			
February 2004			
March 2004			

* SRG monthly precipitation may be post-processed to agree with the 12 AM local standard time convention.

WFOs will fax this form to their RCPM by 30 days after the end of the Evaluation Month.

Example of WS Form B-91 Completed for November 2003

[illegible]

APPENDIX C - FPU TEST CERTIFICATION CHECKLIST

Each WFO shall submit the following documents to the RCPM no later than 15 weeks from start of the period of performance. The package will be known as the WFO Packet. The first 2 items must be print-outs from the NCDC web site: <http://www.ncdc.noaa.gov/nwsonly/hpdingest/oresites/> .

<u>ORE DATA REPORTS, WORKSHEETS, AND SUPPORT DOCUMENTS</u>		<u>YES / NO</u>
1.	Monthly, FPU On-Time Receipt by NCDC (Time stamped by 15 th of month)	_____
2.	Monthly, FPU Availability Percentage by NCDC (84% of all 15-min records)	_____
3.	Monthly, <i>Gauge Data Evaluation Form</i> (Appendix B, <i>ORE Plan</i>)	_____
4.	Monthly, <i>Event Log Worksheet</i> (Signed by NWSREP)	_____
5.	Monthly, FPU Raw Data from WFO (entire month's print-out)	_____
6.	Start and End, Calibration Check of both Precipitation Gauges (15.0 inches)	_____
7.	<i>FPU Trouble Report</i> (Appendix F, <i>ORE Plan</i>) If none, must state 'None Issued'.	_____
8.	Copy of OPS14 Memo on Logistics Support (List of FPU Parts as LRU)	_____
9.	WS Form B-44 Other Equipment (CSSA Print Out)	_____
10.	EMRS Station Equipment Update (EMRS Print Out)	_____

Attach one printed copy of each of the above ten items to this page and then mail to the RCPM.

Meteorologist in Charge (MIC)

WFO ID

Signature

Date

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APPENDIX D : LIST OF VALID ANNOTATIONS FOR GAUGE MODIFICATION ASSEMBLY (GMA)

The GMA numeric keypad, housed outdoors in the steel containment, holds 256 slots for selected remarks of the GMA operator/observer.

001 - 099 Reserved for possible future use with SHEF coding.

100 - 109 Time checks performed by observer or NWSREP.

110 - 149 Annotations to indicate observer actions.

150 - 256 Annotation to indicate NWSREP actions.

Value	Meaning of value
001	Reserved for possible future use - these may be used for SHEF values.
002	Reserved for possible future use - these may be used for SHEF values.
003	Reserved for possible future use - these may be used for SHEF values.
004	Reserved for possible future use - these may be used for SHEF values.
005	Reserved for possible future use - these may be used for SHEF values.
006	Reserved for possible future use - these may be used for SHEF values.
007	Reserved for possible future use - these may be used for SHEF values.
008	Reserved for possible future use - these may be used for SHEF values.
009	Reserved for possible future use - these may be used for SHEF values.
010	Reserved for possible future use - these may be used for SHEF values.
011	Reserved for possible future use - these may be used for SHEF values.
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027	Reserved for possible future use - these may be used for SHEF values.
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029	Reserved for possible future use - these may be used for SHEF values.
030	Reserved for possible future use - these may be used for SHEF values.

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079 Reserved for possible future use - these may be used for SHEF values.
 080 Reserved for possible future use - these may be used for SHEF values.
 081 Reserved for possible future use - these may be used for SHEF values.
 082 Reserved for possible future use - these may be used for SHEF values.
 083 Reserved for possible future use - these may be used for SHEF values.
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 090 Reserved for possible future use - these may be used for SHEF values.
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 096 Reserved for possible future use - these may be used for SHEF values.
 097 Reserved for possible future use - these may be used for SHEF values.
 098 Reserved for possible future use - these may be used for SHEF values.
 099 Reserved for possible future use - these may be used for SHEF values.

Time checks - performed by either observer or NWSREP

100 Time check - no adjustment needed
 101 Adjusted time - clock was slow
 102 Adjusted time - clock was fast
 103 Changed from standard time to daylight savings time
 104 Changed from daylight savings time to standard time
 105
 106
 107
 108
 109

Observer performed maintenance

110 Data from GMA copied to data key
 111
 112 Start of Observer maintenance that exceeds 15 minutes
 113
 114
 115 Emptied bucket - bucket completely emptied.
 116 Partially emptied bucket - some liquid left in bucket.
 117 Added Oil to bucket
 118 Added Antifreeze to bucket
 119
 120
 121
 122
 123

124
125 Installed funnel
126 Removed funnel
127
128
129
130 Cleaned F&P case
131 Cleaned solar panel
132 Cleaned MMTS sensor
133 Cleaned GMA
134
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149 Observer actions completed and FPU in full service

NWSREP Maintenance

150 Annual visit
151 Semi-Annual visit
152 Liaison visit
153 Emergency visit
154
155 Start of NWSREP maintenance that exceeds 15 minutes
156 Data from GMA copied to data key
157
158
159
160 Emptied bucket
161 Emptied and cleaned bucket
162 Partially drained bucket - some liquid remains in bucket
163 Added Oil to bucket
164 Added Antifreeze to bucket
165
166 Installed new bucket to replace a damaged bucket
167
168
169

170	Installed funnel
171	Removed funnel
172	
173	
174	
175	
176	
177	
178	
179	
180	Cleaned F&P case
181	Cleaned solar panel
182	Cleaned MMTS sensor
183	Cleaned GMA
184	
185	
186	
187	
188	
189	
190	Replaced all Flexures
191	Replaced Top Front Flexures
192	Replaced Top Rear Flexures
193	Replaced Bottom Front Flexures
194	Replaced Bottom Rear Flexures
195	Replaced Top Flexures
196	Replaced Bottom Flexures
197	
198	
199	
200	Cleaned MMTS sensor
201	Replaced MMTS sensor
202	
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204	
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210	Replaced GMA - a complete new GMA was installed
211	Replaced GMA battery
212	Replaced GMA pedestal - this is the data logger portion of the GMA
213	Replaced Load Cell in F&P
214	

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Calibration Check - no changes to previous values

Calibration Check - new values were entered

Gage moved to a compatible location - equipment move

Gage moved to a non-compatible location - station relocation.

Gage removed from service - placed in storage

Gage put back in service after being in storage

NWSREP actions completed and FPU in full service

APPENDIX E : NWS INSTRUCTIONS AND POLICY HANDBOOKS

- a. *FPU Observer Instructions (November 2003, ORE Version)*
- b. *NWSREP ORE Instructions (November 2003, FPU ORE Version)*
- c. *WFO Instructions - FPU Data Exchange (November 2003, ORE Version)*
- d. *FPU Installation Instructions, Note 4 (Oct 2002) .* Requires revision to list of the thirteen selected ORE sites. (Mike Wyatt still to provide Flexure Procedure to be included in Appendix B, Section 1 of the FPU Installation Instructions, Engineering Instruction Note 4.
- e. *FPU Technical Manual, Section 5, Preventive and Corrective Maintenance Procedures.*
- f. *NWS Engineering Handbook No. 10, Chapter 4, Section 2, Hydrologic Equipment. (Issuance 76-6, April 30, 1976)*
- g. *Weather Service Operations Manual, Chapter B-17, Cooperative Station Management (March 1993)* To be superseded by NWSI 10-1307, when approved.
- h. *Observing Handbook #2, Cooperative Station Observations (Jul 1989).* To be superseded by NWSI 10-1307, when approved.
- i. *Observing Handbook #6, Cooperative Station Operations (Sep 1993).* To be superseded by NWSI 10-1307, when approved.
- j. *National Weather Service Instructions (NWSI) 10-1307, NWS COOP Weather Observer Program (Draft, June 2003)*
- k. *COOP FPU Implementation Plan (OS22) (Aug 15, 2002)*
- l. *COOP Observer Program, Product Improvement Implementation Plan For Fischer & Porter Upgrade (Aug 15, 2002).*

ELECTRONIC DATA BASES EFFECTED

1. Engineering Management Reporting System (EMRS) data base,
2. Configuration Management Information System (CMIS),
3. Management Information Reporting System (MIRS),
4. Coop Station Service Accountability (CSSA) data base.

APPENDIX F: FPU TROUBLE REPORT

Name of NWSREP : _____ COOP Station Name: _____ WFO Name: _____

Hour and Date of problem :	Where in FPU system is problem?	Describe how the problem was resolved and whether spare parts were ordered :

The NWSREP, Coop Observer, or NCDC shall complete an FPU Trouble Report whenever any component of the FPU system encounters operational degradation or outage during the ORE. Possible problems include: rain gauge equipment, GMA data logging, data key download, upload, data QC, FTP transmission, or NCDC file handling. WFO should submit trouble reports via fax to their RCPM and NCDC to Andy Horvitz (OS7) via e-mail.

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